

ABSTRACT

The present invention provides a high sensitivity atomic magnetometer and methods of measuring low intensity magnetic fields that relate to the use of an alkali metal vapor and a buffer gas; increasing the magnetic polarization of the alkali metal vapor thereby increasing the sensitivity of the alkali metal vapor to a low intensity magnetic field; probing the magnetic polarization of the alkali metal vapor, the probing means providing an output from the alkali metal vapor, the output including characteristics related to the low intensity magnetic field; and measuring means that receives the output, determines the characteristics of the low intensity magnetic field, and provides a representation of the low intensity magnetic field. In addition, the invention relates to a magnetometer and methods that provide a representation of a first magnetic field originating within a sample volume. The sample volume may be part or all of a subject, such as a human subject. The representation includes a representation of a source of a magnetic field occurring within the sample volume displayed in one, two, or three of three orthogonal Cartesian coordinates, referenced to the sample volume.